REMARKS

In the most recent office action, claims 1-15 were rejected under 35 USC ' 103(a) as being unpatentable over Weiss et al (WO 00/04055) in view of Loda (U.S. 4,163,172), Mukohyama et al (U.S. 4,886,840) and Botman et al (Nuclear Instruments and Methods in Physics Research B 139). Applicants respectfully disagree with this rejection.

Claim 1 is the only currently pending independent claim, and recites that the polymerizable composition is irradiated at a pulse rate greater than or equal to about 500 pulses per second. Applicants have discovered that the manner in which the electron beam dose is delivered can have dramatic effects on the polymerization process itself. Specifically, when the dose per pulse is relatively low (e.g. about 1 0 to 90 Gy) and the pulse rate is below 500 Hz, the reaction takes place primarily in the homogenous mode because of the longer time intervals between pulses (diffusion). As the frequency of the pulses is increased above about 500 Hz, the heterogeneous mode of polymerization becomes more dominant, because the shorter interval between pulses increasingly favors heterogeneous kinetics (see pp. 13-14 of the specification). This surprising and unexpected discovery is not appreciated or otherwise made obvious anywhere in the art of record.

None of the references cited by the Examiner describe providing a pulse rate this high. Also, the prior art references utterly fail to teach or suggest the benefit of a relatively low dose per pulse and a high pulse rate.

For example, Loda fails to teach, appreciate, or make obvious the benefits of using low dosage and high frequency to irradiate a polymerizable composition. Indeed, Loda remarks that short length pulses are not desirable when it states that "pulses obtainable from a cold cathode electron gun are thus of very *short length and of limited usefulness* for certain purposes". Column 1, lines 50 to 52 (emphasis added). Loda subsequently speculates that changing of pulse frequency and total duration *may* elicit different chemical reactions, but utterly fails to teach whether high or low pulse frequencies are desirable. Thus, nothing in Loda teaches whether a high pulse frequency is desirable or whether a low pulse frequency is desirable. Loda merely contains a brief speculative statement that changing the pulse frequency may impact the polymerization process. Indeed, it would be more credible to assert that, based upon Loda, pulse

frequency should be kept *low* rather than high, because of the statement in Loda that high frequency pulses are of limited usefulness.

Nothing in the cited references indicates that the devices for generating e-beams described therein should even have been capable of providing pulse frequencies greater than or equal to 500 Hz. For example, the upper range limit described in Botman is 50 Hz, far below the 500 Hz recited in the present claims. Applicants believe a pulse rate minimum that is 10 times that taught in Botman is not obvious. The Examiner appears to assert that it is possible, using Mukohyama, to derive the teaching of pulses in the range of 500 to 3,000 Hz, but Applicants are unable to identify such teaching in Mukohyama. In addition, Mukohyama fails to make obvious the claimed invention because it merely teaches curing resins into a hard coat, which is not analogous to polymerizing monomers into a tacky adhesive, especially a high quality adhesive as taught in the instant application.

The Examiner asserts that "e-beam polymerization of Weiss et al is inherently a heterogeneous single phase e-beam polymerization". Applicants respectfully disagree. Although Weiss teaches a polymerization method for forming a pressure sensitive adhesive, the present invention further improves upon Weiss by teaching the specific polymerization method comprising providing a substrate; coating at least a portion of said substrate with a polymerizable composition; providing an electron beam that is capable of producing pulses of accelerated electrons; and irradiating said polymerizable composition with said pulses of accelerated electrons thereby heterogeneously polymerizing said polymerizable composition in a single phase, said pulses of accelerated electrons having a dose per pulse of about 10 to about 90 Gy, wherein said composition is irradiated with said pulses of accelerated electrons at a pulse rate equal to or greater than about 500 pulses per second. Even if Weiss is asserted to teach heterogeneous polymerization, nothing in Weiss teaches pulses of accelerated the prior art teachings, one would merely seek to adjust total dose, without appreciating the benefits of the use of low doses at high frequencies. This failure of the prior art to teach or suggest the claimed invention necessitates a finding of non-obviousness of the claimed invention.

In contrast to the prior art methods of producing heterogeneous polymerization, the present invention includes a method of producing heterogeneous polymerization by having a low dosed pulse and a high pulse rate. The Examiner refers to Applicants' disclosure at page 2, lines

3-7 for the proposition that heterogeneous e-beam polymerization produces highly gelled polymers of adequate chain lengths between crosslinks. However, the Examiner overlooks the further assertion at page 2, lines 7-10 that three known methods of achieving heterogeneous polymerization include emulsion, solid phase catalysis, and precipitating conditions, and that all three of these methods involve phase separation to maintain the heterogeneous conditions. This is a totally new, highly efficient and unexpected way to achieve the advantage of heterogeneous polymerization in a single phase system. There is no precedence for this in the prior art, and therefore, the claimed invention is patentable over the cited references.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612-746-4783) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 50-3688.

Respectfully submitted,

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